

09/733,392 & 90/005,710

12/21/06

Claim List – Status and Support of Current Amendment Changes

Claim	Status	Type	Support of Changes
1	Pending	Method	"enhance has been changed to read "enhances" – grammatical correctness.
2	Pending	Method	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
3	Pending	Method	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
4	Pending	Method	There are no changes in this amendment.
5	Pending	Method	There are no changes in this amendment.
6	Pending	Method	There are no changes in this amendment.
7	Pending	Method	There are no changes in this amendment.
8	Pending	Method	There are no changes in this amendment.
9	Cancelled	N/A	N/A
10	Pending	Method	There are no changes in this amendment.
11	Original	Method	There are no changes in this amendment.
12	Pending	Method	There are no changes in this amendment.
13	Pending	Method	There are no changes in this amendment.
14	Pending	Method	There are no changes in this amendment.
15	Pending	Method	"present" is changed to "added" – grammatical correctness. "cationic polyacrylamide" changed to "said cationic polyacrylamide" – antecedent basis.
16	Pending	Method	There are no changes in this amendment.
17	Cancelled	N/A	N/A
18	Cancelled	N/A	N/A
19	Pending	Method	There are no changes in this amendment.
20	Cancelled	N/A	N/A
21	Cancelled	N/A	N/A
22	Pending	Method	There are no changes in this amendment.
23	Cancelled	N/A	N/A
24	Pending	Method	There are no changes in this amendment.
25	Pending	Method	There are no changes in this amendment.
26	Pending	Method	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
27	Pending	Method	There are no changes in this amendment.
28	Pending	Method	There are no changes in this amendment.
29	Cancelled	N/A	N/A
30	Cancelled	N/A	N/A
31	Cancelled	N/A	N/A
32	Cancelled	N/A	N/A
33	Pending	Method	There are no changes in this amendment.
34	Pending	Method	There are no changes in this amendment.
35	Pending	Method	There are no changes in this amendment.
36	Pending	Method	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.

09/733,392 & 90/005,710

12/21/06

37	Pending	Method	There are no changes in this amendment.
38	Pending	Method	There are no changes in this amendment.
39	Cancelled	N/A	N/A
40	Pending	Method	There are no changes in this amendment.
41	Pending	Composition	There are no changes in this amendment.
42	Cancelled	N/A	N/A
43	Cancelled	N/A	N/A
44	Pending	Composition	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
45	Pending	Composition	There are no changes in this amendment.
46	Pending	Composition	There are no changes in this amendment.
47	Pending	Composition	There are no changes in this amendment.
48	Pending	Composition	"microflocs" changed to "flocs" – specification enablement, col. 5 lines 45 – 48.
49	Cancelled	N/A	N/A
50	Cancelled	N/A	N/A
51	Pending	Composition	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
52	Pending	Composition	There are no changes in this amendment.
53	Pending	Composition	There are no changes in this amendment.
54	Pending	Composition	There are no changes in this amendment.
55	Pending	Composition	"agglomeration" removed. "cationic polyacrylamide" removed. "microfloc removed" – specification enablement, col. 5 lines 2 – 9.
56	Cancelled	N/A	N/A
57	Cancelled	N/A	N/A
58	Pending	Composition	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
59	Cancelled	N/A	N/A
60	Cancelled	N/A	N/A
61	Cancelled	N/A	N/A
62	Cancelled	N/A	N/A
63	Cancelled	N/A	N/A
64	Cancelled	N/A	N/A
65	Cancelled	N/A	N/A
66	Cancelled	N/A	N/A
67	Pending	Composition	There are no changes in this amendment.
68	Pending	Composition	"poly" inserted for technical correctness – support is found in 5 lines 11 - 38.
69	Pending	Composition	There are no changes in this amendment.
70	Pending	Composition	There are no changes in this amendment.
71	Pending	Composition	There are no changes in this amendment.
72	Cancelled	N/A	N/A
73	Pending	Method	There are no changes in this amendment.
74 - 79	Cancelled	Method	N/A

09/733,392 & 90/005,710

12/21/06

**Examiner's Remarks, Objections and Rejections with
Applicant/Owner's Response**

Examiner Comment

Applicant/owner states at page 21 of the response filed 12/16/05 that the term "cationic" has been removed from claim 22. This remark cannot be understood. Claim 22, as filed on 12/16/05 at page 5, twice recites the phrase "cationic polyacrylamide". Clarification of applicant/owner's remark is requested.

Applicant/Owner Response

Applicant/Owner has made a typographical error in the RCE/Office Action Response for which he apologizes to the Examiner. Applicant/owner would like to state to the Examiner that claim 22 is correct as written "cationic polyacrylamide".

Examiner Objection to the Specification

Objection is made to the specification because of the following informalities:

The word "messophilic" is misspelled as "mesophyllic" at col. 1 lines 59, 61 and col. 2 lines 25, 27; and

The text at col. 5 lines 4 – 6 refers to two compounds, i.e. DADMAC and epi-DMA as "polyquaternary" amines. They are not polymeric.

Appropriate correction is required.

Applicant's Response

Applicant/Owner thanks the Examiner for his attention to detail. The Examiner is correct, as the word messophilic is misspelled at col. 1 lines 59, 61 and at col. 2 lines 25, 27. In addition, the Examiner is correct, as col. 5 lines 4 – 6 obviously refer to a poly(DADMAC) and a poly(Epi-DMA). The appropriate amendments have been made herein to correct both objections according to 37 CFR 1.173.

Examiner Note:

"polymeric quaternary ammonium compound" and "quaternary polyacrylamide"

The Examiner states "Whenever applicant/owner in the original disclosure used the term 'polyquaternary amine,' (col. 3 line 63; col. 5 lines 4 – 38) or the like in connection to his invention, he

09/733,392 & 90/005,710

12/21/06

was referring to the polymers poly(diallyl dimethyl ammonium chloride) or poly(epichlorohydrin dimethyl amine), i.e. poly(DADMAC or poly(Epi-DMA). See, for example, col. 1 lines 10 – 16; and Examples 1 – 3. These polymers were described in connection with only the Method One (col. 5 lines 52 – col. 6 lined 8) or the Method Two (col. 6 lines 9 – 44) embodiments of the invention. Never were any of these compounds added to the sludge in Method Three (col. 6 line 44 – col. 7 line 3) or Method Four (col. 7 lines 4 – 38) embodiments. On the other hand, whenever applicant/owner in the original disclosure used the term ‘quaternized polyacrylamide,’ he was referring to a copolymer made from acrylamide and a quaternary ammonium compound, e.g., poly[acrylamide-co-DADMAC] or poly[acrylamide-co-(epi-DMA)] or poly[acrylamide-co-(allyl chloride)]. See also Examples 4 – 7.

Applicant/Owner Response

Applicant/Owner would like to respectfully present to the Examiner that the Examiner's note does not in total reflect the subject specification/disclosure. Applicant/Owner refers the Examiner to col. 3 lines 60 – 63 which states:

“An additional object of the invention is to devise a method for dewatering of biological sludge that has been digested by a thermophilic digestion process with polyquaternary amine being used as the primary component.”

Along with col. 5 lines 2 – 9 which states:

“The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge. Di-allyl di-methyl ammonium chlorides (DADMAC) and epichlorohydrin di-methyl amine (epi-DMA) are two preferred embodiments. **(Emphasis added)**”

Further col. 5 lines 52 – col. 6 line 9 states:

“Method one involves the addition of a **polyquaternary amine** directly to the sludge. Since the **polyquaternary amine** does not contain enough molecular weight for dewatering of the sludge, once the microflocs of sludge have formed from the **polyquaternary amine**, a cationic polyacrylamide is added to form a floc that will dewater well. The ratio of **polyquaternary amine** to cationic polyacrylamide appears to be near about 1:1 where the polyquaternary amine is of high molecular weight (e.g. from about 500,000 to about 3,000,000) and where the cationic polyacrylamide is of higher molecular weight (e.g. from about 5,000,000 to about 16,000,000). In a preferred embodiment, the ratio of the **polymeric quaternary ammonium compound** with respect to the cationic polyacrylamide is between about 1:10 to about 20:1. In a thermophilic digested sludge with a solids component of 4.4 percent, a total polymer dosage requirement of near 950 ppm is shown. As the solids component of the sludge increases or decreases, the amount of **polyquaternary amine** and polyacrylamide increases or decreases proportionately. The polymer concentration to solids component ratio (the ratio of the total polymer dosage requirement to the

09/733,392 & 90/005,710

12/21/06

percentage of solids component of the sludge) may vary from about 50 ppm:1 percent to about 300 ppm:1 percent, depending on the sludge type. **(Emphasis added)**

Further, col. 6 lines 9 – 44 states:

"Method two involves the addition of a polyquaternary amine directly sludge. Since the polyquaternary amine does not contain enough molecular weight dewatering of the sludge, an excess amount of the polyquaternary amine is added so that a noticeable cationic overcharge exists within the microfloc system. This cationic overcharge will exist when the supernatant water is rather clear and the size of the microflocs ceases to grow with chemical addition. This requires approximately 20 to 30 percent addition increase of the polyquaternary amine as compared to method one. An anionic polyacrylamide is then added for final floc formation. The ratio of polyquaternary amine to anionic polyacrylamide appears to be near 10:1 where the polyquaternary amine is of high molecular weight (e.g. from about 500,000 to about 3,000,000) and where the anionic polyacrylamide is of higher molecular weight (e.g. from about 5,000,000 to about 15,000,000) and is 40 percent anionic. As in method one, in a preferred embodiment, the ratio of the polymeric quaternary ammonium compound with respect to the cationic polyacrylamide is between about 1:10 to about 20:1. In a thermophilic digested sludge with a solids component of 4.4 percent, a total polymer dosage requirement of near 950 ppm is shown. As the solids component of the sludge increases or decreases, the amount of polyquaternary amine and polyacrylamide increases or decreases proportionately. The polymer concentration to solids component ratio may vary from about 50 ppm:1 percent to about 300 ppm:1 percent, depending on the sludge type. CV 6140, as an emulsion copolymer of polyacrylamide with acrylic acid, is a preferable candidate for method two. CV 6140 has a 40% anionic charge density, a specific gravity of 1.03 at about 77 °F (25 °C), a freezing point of approximately 32 °F (0 °C), viscosity ranging from about 400 cps to 1200 cps at about 77 °F (25 °C), an activity rate of about 40% and a flash point of approximately 150 °F (65 °C)." **(Emphasis added)**

Therefore, the specification does not limit the polyquaternary amines to poly(DADMAC) and poly(epi-DMA). The specification refers to "polyquaternary amines" as the "significant improvements of this invention"; this is while poly(DADMAC) and poly(epi-DMA) are referred to as "preferred embodiments". Further, there is no disclosure within Method One or within Method Two to limit either method to a poly(DADMAC) or to a poly(epi-DMA); instead methods one and two each teach "polyquaternary amine", e.g. polymeric quaternary ammonium compound.

The Examples of a specification are to be explanatory of a specification and not limiting of the specification. Specifically, MPEP section 2123 states:

"Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971)." **(Emphasis added)**

Further, MPEP Section 2164.02 states:

09/733,392 & 90/005,710
12/21/06

"For a claimed genus, representative examples together with a statement applicable to the genus as a whole will ordinarily be sufficient if one skilled in the art (in view of level of skill, state of the art and the information in the specification) would expect the claimed genus could be used in that manner without undue experimentation. Proof of enablement will be required for other members of the claimed genus only where adequate reasons are advanced by the examiner to establish that a person skilled in the art could not use the genus as a whole without undue experimentation." (Emphasis added)

In addition, the instant invention specification in col. 1 lines 13 – 25 states:

"Examples of polymeric quaternary ammonium compounds are the di-allyl di-methyl ammonium chloride (DADMAC) variety and the epichlorohydrin di-methyl amine (epi-DMA) variety. Further, cationic and anionic polyacrylamides, where the cationic or anionic moiety may result from various comonomers in the polymerization process of polyacrylamide, have been applied in dewatering methods. Traditional polyacrylamide polymers do not contain polyquaternization from allyl chloride or from epi-DMA. Only within the last three years have polyacrylamides containing cationic monomers, based on allyl chlorides, been available. (Emphasis Added)

This is while Method 3 is described in col. 6 lines 44 – 58 which states:

"Method three involves the addition of a quaternized polyacrylamide where the cationic monomer of the polyacrylamide is derived from a polymeric quaternary ammonium compound. Allylic chloride and epichlorohydrin di-methyl amine are preferred sources for the cationic monomer. The most preferred embodiment of the quaternized polyacrylamide used is:

a copolymer of polyacrylamide with a cationic monomer that is quaternized in the polyacrylamide, the copolymer having a specific gravity of 1.2 at about 77 °F (25 °C), a freezing point of approximately 23 °F (-5 °C), viscosity of less than 1200 cps at about 40 °F (4.4 °C), an activity rate of about 38% and a flash point of about 275 °F (135 °C.), (CV 5380)." (Emphasis Added)

Therefore, the specification does not limit the "quaternized polyacrylamide" to a polyacrylamide comprising DADMAC or epi-DMA. The specification refers to "a quaternized polyacrylamide where the cationic monomer of the polyacrylamide is derived from a polymeric quaternary ammonium compound"; this is while "[a]llylic chloride and epichlorohydrin di-methyl amine are preferred". Finally, "[t]he most preferred embodiment of the quaternized polyacrylamide used is [a] copolymer of polyacrylamide with a cationic monomer that is quaternized in the polyacrylamide".

09/733,392 & 90/005,710
12/21/06

Again, as stated above, the Examples of a specification are to be explanatory of the specification and not limiting of the specification.

Further, the polymeric quaternary ammonium compound could not be limited to just poly(DADMAC) or poly(epi-DMA) by claim differentiation, e.g. claim 1 versus claims 2 and 3, as originally prosecuted in the instant invention. Also, claim 22 vs. 26, claim 33 vs. 36, 48 vs. 51, 55 vs. 58, and 67 vs. 68 demonstrate by claim differentiation that Applicant/Owner teaches a polymeric quaternary ammonium compound to be differentiated, e.g. genus, versus poly(DADMAC) and poly(epi-DMA), e.g. species.

Applicant/Owner concludes that the instant invention specification does not limit the polymeric quaternary ammonium compound to poly(DADMAC) and poly(epi-DMA). Nor does the instant invention specification limit the "quaternized polyacrylamide to a polyacrylamide comprising a quaternized moiety made from DADMAC or epi-DMA.

Examiner Rejection – 35 U.S.C. Sec 251 – Claims Drawn to Non-Elected Invention

Claims 74 – 79 are rejected under 35 U.S.C. Sec 251 as applicant is attempting to reclaim subject matter which was nonelected in the original application. The addition of claims in the reissue application which were nonelected in the original patent application is an error which is not correctable by reissue.

Applicant/Owner Response

Applicant/Owner has apparently incorrectly added these claims. In light of the restriction requirement placed on the parent application and MPEP 1412.01, as well as the Examiner's rejection, Applicant/Owner has cancelled claims 74 – 79.

Applicant/Owner would like to direct the Examiner that the restriction requirement imposed by Examiner Wyse related specifically to "The four biological sludge dewatering methods listed by applicant in the Abstract." These are the same four methods presented in more detail within the instant invention specification under the heading "DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT". This is while the genus teaching statement by Applicant/Owner is

09/733,392 & 90/005,710
12/21/06

prior to the four methods in that section of the instant invention specification. Specifically, Applicant/Owner makes a genus statement in col. 5 lines 2 – 4 that:

“The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge. Di-allyl di-methyl ammonium chlorides (DADMAC) and epichlorohydrin di-methyl amine (epi-DMA) are two preferred embodiments. **(Emphasis added)**”

Applicant/Owner would also like to respectfully present to the Examiner recent 2002 case law which is quoted in MPEP 1412.01 and which allows the expansion of a genus teaching during a re-issue application, if that genus teaching covers a previously restricted set of species claim(s). A copy of the In RE Michael P. Doyle case is attached hereto, with underlining, for the Examiner's review.

Applicant/Owner would like to respectfully present to the Examiner and place in this prosecution file that a “quaternized polyacrylamide” is a “polyquaternary amine”. e.g. “polymeric quaternary ammonium compound”. While a polyacrylamide polymer is based upon the acrylamide monomer, the term quaternized describes a nitrogen moiety wherein four available s-p orbitals in the nitrogen are filled, thereby creating an Sp^3 orbital hybridization structure on the nitrogen. And, regardless of the electron orbital structure, a quaternized nitrogen is a quaternized nitrogen.

As defined by *Hawley's Condensed Chemical Dictionary* (Hawley's) an amine is defined as:

amine. A class of organic compounds of nitrogen that may be considered as derived from ammonia (NH_3) by replacing one or more of the hydrogen atoms with alkyl groups. The amine is primary, secondary, or tertiary depending on whether one, two, or three of the hydrogen atoms are replaced. All amines are basic in nature, and usually combine readily with hydrochloric or other strong acids to form salt.

And, ammonium is defined by Webster's Ninth New Collegiate Dictionary (Webster's) as:

ammonium: an ion NH_4^+ or radical NH_4 derived from ammonium by combination with a hydrogen ion or atom and known in compounds (as salts) that resemble in properties the compounds of the alkali metals and in organic compounds (as quaternary ammonium compounds)

09/733,392 & 90/005,710
12/21/06

And, quaternized nitrogen is defined in Hawley's as:

Quaternary ammonium salt. A type of organic nitrogen compound in which the molecular structure includes a central nitrogen atom joined to four organic groups (the cation) and a negatively charged acid radical (the anion)."

And, poly is defined by Hawley's as:

Poly-, A prefix signifying many. For example, a polymer is an aggregate formed by combination of a number of single molecules.

And, polymer is defined by Webster's as:

polymer: a chemical compound or mixture of compounds formed by polymerization and consisting essentially of repeating structural units

And, acrylamide is defined by Hawley's as:

acrylamide. $\text{CH}_2\text{CHCONH}_2$

And, polyacrylamide is defined by Hawley's as:

Polyacrylamide. $(\text{CH}_2\text{CHCONH}_2)_n$

Therefore, a quaternized polyacrylamide is a subgroup or a species under the genus of polymeric quaternary ammonium compounds, e.g. polyquaternary amines. This is while another species would be poly(DADMAC) and another species would be poly(epi-DMA), both under the genus polymeric quaternary ammonium compounds.

Objection by the Examiner – 37 CFR 1.173(b)

The amendment filed December 16, 2005, proposed amendments to claims 1 and 15 that do not comply with 37 CFR 1.173(b), which sets forth the manner of making amendments in reissue applications. Specifically, at claim 1 line 2 (see page 2 of 24 of the 12/16/05 response), in the phrase, "process, comprising:" the comma should be underlined for it does not appear in the original patent claim 1. Further, at claim 15 lines 4 – 5 (see page 4 of 24 of the 12/16/05 response), the phrase, "is added along with a cationic polyacrylamide; and said polymeric" because "a cationic" does not appear in the original claim whereas "said" does so appear. A supplemental paper correctly amending the reissue application is required.

09/733,392 & 90/005,710
12/21/06

Applicant/Owner Response

Along with this Office Action response, Applicant/Owner is enclosing for the Examiner pages 2 and 4 from the 12/16/05 Office Action Response which have the comma underlined in claim 1 and claim 15 marks corrected.

35 U.S.C. Sec. 112, second paragraph – essential step missing

The following rejection is predicted on the examiner's construction of "polymeric quaternary ammonium compound" as reading on poly(DADMAC) or poly(epi-DMA) and **not** reading on poly[acrylamide-co-(DADMAC)] or poly[acrylamide-co-(epi-DMA)]. See the Note, *supra*.

Claims 33 – 37, 40 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted step is: Contacting the sludge with a polyacrylamide. Claim 33 is directed to a method for dewatering sludge. The claimed method recites only the step of adding to the sludge a polymeric quaternary ammonium compound even though the specification states that each "polyquaternary amine [sic] chemical component used in the chemical method is not large enough to create large enough flocs to dewater the sludge." See also col. 5 lines 53 – 57. Accordingly, any claim that does not recite the addition of both a polymeric quaternary ammonium compound and a polyacrylamide fails to recite an essential step of the process for dewatering sludge.

Claims 34 – 37 are rejected for the same reasons as claim 33 given that none of claims 34 – 37 recites the step of "further comprising adding polyacrylamide to the sludge," or the like. Note that claims 38, 73 are not rejected on the foregoing basis.

Applicant/Owner Response

As presented above, Applicant/Owner traversed the Examiner's construction of "polymeric quaternary ammonium compound" as referring only to poly(DADMAC) or poly(epi-DMA)". Further, Applicant/Owner would like to respectfully state to the Examiner that Applicant/Owner does **not** state generally within the specification of the Instant Invention that "each 'polyquaternary amine [sic] chemical component used in the chemical method is not large enough to create large enough flocs to dewater the sludge.'" In order to make his rejection, the Examiner is interpreting claim 33 so as to relate only to Method One of the instant invention specification, which is located in col. 4 line 52 to col. 6 line 9; this is while restricting Method One to preferred embodiments only, e.g. poly(DADMAC) and poly(epi-DMA). Applicant/Owner agrees

09/733,392 & 90/005,710
12/21/06

with the Examiner that Method One is a two component system; however, Method One is not the only teaching within the specification of the instant invention. Applicant/Owner would like to direct the Examiner to the section of the instant invention specification entitled "DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT" col. 5 lines 2 – 4, which is just prior to Method One and which states:

"The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge."

Therefore, Applicant/Owner has taught the use of a polyquaternary amine, e.g. polymeric quaternary ammonium compound, alone. In concert with this presentation to the Examiner, Applicant/Owner directs the Examiner to both the restriction requirement made by Examiner Wyse and the In RE Michael P. Doyle decision above.

Further, one of ordinary skill in the art would know of the importance of molecular weight in the dewatering of sludge. This is while the importance of molecular weight is also taught by Applicant/inventor in col. 5 lines 31 – 32 which state:

"The higher molecular weight polyquaternary amines demonstrate improved performance."

Further, col. 5 lines 52 – 63 state:

"Method one involves the addition of a polyquaternary amine directly to the sludge. Since the polyquaternary amine does not contain enough molecular weight for dewatering of the sludge, once the microflocs of sludge have formed from the polyquaternary amine, a cationic polyacrylamide is added to form a floc that will dewater well. The ratio of polyquaternary amine to cationic polyacrylamide appears to be near about 1:1 where the polyquaternary amine is of high molecular weight (e.g. from about 500,000 to about 3,000,000) and where the cationic polyacrylamide is of higher molecular weight (e.g. from about 5,000,000 to about 16,000,000)." (Emphasis added)

This molecular weight teaching is presented again in Method Four, col. 7 lines 11 – 14, which state:

"The cationic polyacrylamide provides a very high molecular weight (e.g. from about 5,000,000 to about 16,000,000) to build a large strong floc that dewateres well." (Emphasis added)

09/733,392 & 90/005,710
12/21/06

Therefore, regardless of the molecular weight knowledge known by one of ordinary skill in the art, Applicant/Owner has taught the importance of: 1) a polymeric quaternized ammonium compound, and 2) the importance of a 5,000,000 minimum molecular weight in order to "from a floc that will dewater well" and to "build a large strong floc that dewater well".

Further, Applicant/Owner can find **no teaching or suggestion in the instant invention specification** so as to **limit** Applicant/Owner's teachings to require the use of Method One or to require that: the molecular weight of a poly(DADMAC) be less than 5,000,000, the molecular weight of a poly(epi-DMA) be less than 5,000,000, or a polymeric quaternary ammonium compound of about 5,000,000 molecular weight or greater be a polyacrylamide. In contrast, the use of a **lower molecular weight**, e.g. less than 5,000,000, quaternized ammonium polymer with a polyacrylamide is but two embodiments of the instant invention, e.g. Method One and Method Two.

Applicant/Owner has respectfully traversed the Examiner's rejection. Applicant/Owner respectfully asks for an allowance of claims 33 – 37 and 40, as amended herein.

35 U.S.C. 112, first paragraph, description

The following rejection is predicated on the examiner's construction of "polymeric quaternary ammonium compound" as reading on poly(DADMAC) or poly(epi-DMA) and not reading on poly[acrylamide-co-(DADMAC)] or poly[acrylamide-co-(epi-DMA)]. See the Note, *supra*.

Claim 34 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Given the examiner's interpretation that "quaternized polyacrylamide" does not read on poly(DADMAC) or poly(epi-DMA) in this case, see Note, supra, the application as filed fails to describe a "polymeric quaternary ammonium compound" having a molecular weight as large as 5,000,000. Only the copolymer, i.e., the "quaternized polyacrylamide," had a molecular weight

09/733,392 & 90/005,710
12/21/06

as large as 5,000,000. (col 7 line 13) The largest "polymeric quaternary ammonium compound" had a molecular weight of only about 3,000,000.

Applicant/Owner Response

As presented above, Applicant/Owner has traversed the Examiner's construction of "polymeric quaternary ammonium compound" as referring only to poly(DADMAC) or poly(epi-DMA)".

Further, Applicant/Owner would like to respectfully present to the Examiner that Applicant/Owner teaches both the use of a polymeric quaternary ammonium compound **alone** and of the importance of a **molecular weight from about 5,000,000**. Specifically, col. 5 lines 2 – 4 states:

"The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge."

Further, col. 5 lines 31 – 32 which states:

"The higher molecular weight polyquaternary amines demonstrate improved performance."

And, col. 5 lines 52 – 63 state:

"Method one involves the addition of a **polyquaternary amine** directly to the sludge. Since the **polyquaternary amine does not contain enough molecular weight for dewatering of the sludge**, once the microflocs of sludge have formed from the polyquaternary amine, a **cationic polyacrylamide is added to form a floc that will dewater well**. The ratio of polyquaternary amine to cationic polyacrylamide appears to be near about 1:1 where the polyquaternary amine is of high molecular weight (e.g. from about 500,000 to about 3,000,000) and where the **cationic polyacrylamide is of higher molecular weight (e.g. from about 5,000,000 to about 16,000,000).**" (Emphasis added)

This molecular weight teaching is presented again in Method Four, col. 7 lines 11 – 14, which state:

"The cationic polyacrylamide provides a very high molecular weight (e.g. from about 5,000,000 to about 16,000,000) to build a **large strong floc that dewateres well.**" (Emphasis added)

Therefore, Applicant/Owner teaches the **individual** use of a quaternized ammonium polymer, while also teaching the importance of molecular weight,

09/733,392 & 90/005,710
12/21/06

e.g. "about 5,000,000 to about 16,000,000", to "from a floc that will dewater well" and to "build a large strong floc that dewater well".

As said construction and Examiner's rejection is traversed, Applicant/Owner respectfully asks for an allowance of claim 34, as amended herein.

35 U.S.C. 112, first paragraph, description

Claims 48, 51 - 55, 58 - 61, 78 are rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The disclosure teaches that addition of the "primary component," or the coagulant, e.g., poly(DADMAC) or poly(epi-DMA), forms "microflocs." Upon addition of the polyacrylamide, the microflocs are "bridged" or agglomerated into what applicant describes as "flocs." Nowhere does applicant/owner describe the formation of "microflocs" in a sludge composition comprising the flocculent, polyacrylamide. Accordingly, these claims are rejected for reciting a sludge composition comprising microflocs in the presence of both a coagulant (polymeric quaternary ammonium compound) and flocculent (polyacrylamide or quaternized polyacrylamide).

Per claims 55, 58 - 61, the application supports microflocs and flocs, but does not support "an agglomeration of microflocs," as recited in claim 58. This rejection can be overcome by amending the quoted phrase to "flocs".

Per claim 78, the application fails to describe cationic polyacrylamide having a molecular weight in the range of about 5,000,000 to about 15,000,000. The range of about 5,000,000 to about 15,000,000 describes only anionic polyacrylamide (col 6 line 25). The MW range of cationic polyacrylamide described in the specification was about 5,000,000 to about 16,000,000 (col 5 line 63).

Applicant/Owner's Response

Applicant/Owner appreciates the attention to detail provided by the Examiner. Applicant/Owner has amended claim 48 to recite "floc" instead of "microfloc". Applicant/Owner has amended claim 55 to only refer to

09/733,392 & 90/005,710
12/21/06

polyquaternized ammonium compound. Applicant/Owner has canceled all dependant claims to claim 55 which relate to polyacrylamide. Applicant/Owner has canceled claims 59 – 66. Claim 78 has been canceled.

Applicant/Owner respectfully asks for an allowance of claims 48, 51 – 55 and 58 as amended herein.

35 U.S.C. 112, first paragraph, description

The following rejection is predicated on the examiner's construction of "polymeric quaternary ammonium compound" as reading on poly(DADMAC) or poly(epi-DMA) and not reading on poly[acrylamide-co-(DADMAC)] or poly[acrylamide-co-(epi-DMA)]. See the Note, *supra*.

Claim 71 is rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The disclosure fails to describe "polymeric quaternary ammonium compounds" having a molecular weight over about 3,000,000.

Applicant/Owner Response

As presented above, Applicant/Owner has traversed the Examiner's construction of "polymeric quaternary ammonium compound" as referring only to poly(DADMAC) or poly(epi-DMA)".

Further, Applicant/Owner would like to respectfully present to the Examiner that Applicant/Owner teaches both the use of a polymeric quaternary ammonium compound **alone** and of the importance of a **molecular weight from about 5,000,000**. Specifically, col. 5 lines 2 – 4 states:

"The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge."

Further, col. 5 lines 31 – 32 which states:

"The higher molecular weight polyquaternary amines demonstrate improved performance."

And, col. 5 lines 52 – 63 states:

09/733,392 & 90/005,710
12/21/06

"Method one involves the addition of a polyquaternary amine directly to the sludge. Since the polyquaternary amine does not contain enough molecular weight for dewatering of the sludge, once the microflocs of sludge have formed from the polyquaternary amine, a cationic polyacrylamide is added to form a floc that will dewater well. The ratio of polyquaternary amine to cationic polyacrylamide appears to be near about 1:1 where the polyquaternary amine is of high molecular weight (e.g. from about 500,000 to about 3,000,000) and where the cationic polyacrylamide is of higher molecular weight (e.g. from about 5,000,000 to about 16,000,000)." (Emphasis added)

This molecular weight teaching is presented again in Method Four, col. 7 lines 11 – 14, which states:

"The cationic polyacrylamide provides a very high molecular weight (e.g. from about 5,000,000 to about 16,000,000) to build a large strong floc that dewater well." (Emphasis added)

Therefore, Applicant/Owner teaches the **individual** use of a quaternized ammonium polymer, while also teaching the importance of molecular weight, e.g. "about 5,000,000 to about 16,000,000", to "from a floc that will dewater well" and to "build a large strong floc that dewater well".

As said construction and Examiner's rejection is traversed, Applicant/Owner respectfully asks for an allowance of claim 71, as amended herein.

35 U.S.C. 112, second paragraph

Claims 2 – 3, 44, 51, 58, 68, and 75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 limits the scope of the "polymeric quaternary ammonium compound" to "di-allyl di-methyl ammonium chloride." This recitation is confusing because while a compound may clearly and appropriately be "polymeric" is as recited in claim 1, the compound "di-allyl di-methyl ammonium chloride (DADMAC)" is equally clearly not polymeric. This rejection may be overcome by amending claim 2 to read, "wherein the polymeric quaternary ammonium compound[s] is[are] from] poly(di-allyl di-methyl ammonium chloride (polyDADMAC)) [family]." A similar rejection applies to claim 3 with respect to epi-DMA not being a polymeric compound. Similar bases apply to claims 44, 51, 58, 68, and 75. Correction is required.

09/733,392 & 90/005,710
12/21/06

Similarly, [c]laims 26, 36, 44, 51, 58, 68, 75, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The following abbreviated form of [c]laim 26 is exemplary of the issue: Claim 26 states, "wherein [the] polymeric quaternary ammonium compound comprises...di-allyl di-methyl ammonium chloride." While the polymeric quaternary ammonium compound may comprise mers *derived from* di-allyl di-methyl ammonium chloride, the polymer does not comprise the ammonium chloride compound any more than polyethylene comprises ethane. Compare, for example, the monomer at col 2 lines 10-16 of USP 3288770 to Butler, viz., ... with the polymer at col 2 lines 46-64, viz.,...where A and B are methyl groups and X is chlorine. Nowhere in the polymer may one find the monomer at least for the reason that the later bears no allyl groups or carbon-carbon double bonds (other than at the terminal portions of the polymer) while the former conspicuously bears such groups. Correction is required.

Claims 8, 10 - 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Per claim 8, the term "cationic overcharge" cannot be understood because the specification does not define the term and there does not appear to be an art-recognized understanding of this term. Claims 10 - 13, all of which depend from claim 8, are rejected for the same reason as claim 8.

Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear whether the "cationic polyacrylamide" recited at claim 15, line 4 is the same polyacrylamide that is recited in claim 1. If so, a clause in claim 15, such as, "wherein said polyacrylamide is cationic, and said polyquaternary ammonium compound is added along with said cationic polyacrylamide," or the like, would resolve this lack of clarity.

Applicant/Owner Response

Applicant/Owner appreciates the attention to detail provided by the Examiner. Applicant/Owner has amended claims 2 - 3, 26, 36, 44, 51, 58, 68, and 75 to state poly(...), as encouraged by the Examiner. As such, Applicant/Owner has

09/733,392 & 90/005,710
12/21/06

corrected the claim deficiency as noted by the examiner. Applicant/Owner requests an allowance of claims 2 – 3, 44, 51, 58, 68, and 75 as amended herein.

Applicant/Owner has investigated the Examiner's rejection relating to a definition of "cationic overcharge". Cationic overcharge is specifically described in col. 6 lines 14 – 18:

"This cationic overcharge will exist when the supernatant water is rather clear and the size of the microflocs ceases to grow with chemical addition. This requires approximately 20 to 30 percent addition increase of the polyquaternary amine as compared to method one."

Consequently, Applicant/Owner has respectfully located within the specification of the instant invention a description/definition of cationic overcharge. Therefore, Applicant/Owner has respectfully traversed the Examiners rejection and respectfully requests an allowance of claims 8, 10 – 13 as amended herein.

Applicant/Owner has reworded Claim 15 to recite "said cationic polyacrylamide". Therefore, Applicant/Owner has respectfully traversed the Examiners rejection and respectfully requests an allowance of claim 15 as amended herein.

35 U.S.C. 112, second paragraph

Claim 24 is rejected under 35 U.S.C. 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 24 requires that "said polymeric quaternary ammonium compounds compris[e] a polymeric quaternary ammonium compound" having a specified molecular weight. It is unclear just how many polymeric quaternary compounds we are dealing with here. Does claim 24 require at least two different polymeric quaternary ammonium compounds, at least one of which meets the molecular weight limitation? Similar rejections apply to the recitations of cationic polyacrylamide. For this rejection to be overcome, it is suggested that claim 24 be amended to read as follows: "The method of claim 22, wherein said polymeric quaternary ammonium compound has a molecular weight in the range of about 500,000 to about 3,000,000 and said cationic polyacrylamide has a molecular weight in the range of about 5,000 to about 16,000,000" [sic]."

09/733,392 & 90/005,710
12/21/06

Applicant/Owner Response

In each case of claim 24 (while Applicant/Owner has proffered the same claim language in claims 47, 54 and 78) the claim does read one polymer; however, as is known in the art, polymer blending is commonly practiced. This is while polymer blending can occur both in the polymerization reactor and post reactor. Should one blend a 50,000 molecular weight polymeric quaternary ammonium compound with a 2,000,000 molecular weight polymeric quaternary ammonium compound, Applicant/Owner wishes to be sure that the claimed component within the "polymer blend" be claimed. The same argument holds true for the molecular weight of the polyacrylamide.

As the claim is supported in the specification by molecular weight and each claim only requires one polymer within the molecular weight specified, Applicant/Owner believes that he has both answered the Examiner's question and clarified the claim language, e.g. "comprises a...".

Applicant/Owner has respectfully traversed the Examiners rejection and respectfully requests an allowance of claim 15 as amended herein.

35 U.S.C. 112, second paragraph

Claims 75 – 77, 79 ...

Applicant/Owner Response

Claims 75 – 79 have been canceled.

35 U.S.C. 103(a) Eberhard and McGrow

Claims 1 – 2, 4 – 8, 10 – 13, 15 – 16, 19, 22, 24 – 26, 33 – 38, 40, 41, 44 – 48, 51 – 55, 58 – 61, 67 – 71, 73, 75 are rejected under 35 USC Sec. 103(a) over Eberhard (in view of Williams) and McGrow (in view of Reimschuessel and USP 5178774 to Payne).

Applicant/Owner Response

The Instant Independent Claims - All of the instant independent claims at least require: 1) biological sludge from a thermophilic digestion process, and 2) a polymeric quaternary ammonium compound. This is while many of the instant

09/733,392 & 90/005,710
12/21/06

claims further require a cationic polyacrylamide and others further require an anionic polyacrylamide. These are all required limitations within the instant claims as taught by the instant invention.

Eberhard — U.S. Pat. No. 5,019,267 to Eberhard ('267) teaches the use of chelating agents to pretreat the sludge prior to dewatering with a cationic polyacrylamide. Specifically, col. 134 lines 13 – 21 states:

"According to the invention, the liquid organic matter to be treated is mixed in a manner known per se with from about 0.001% to about 0.1% by weight, based on the organic share of dry matter, of a chelating agent, suitably a salt of nitrilotriacetic acid, and with from about 0.001 to about 1.5% by weight of an enzyme or a mixture of enzymes for breaking down the organic components of the solids contained, and intensively aerated in a bioreactor." **(Emphasis added)**

Further, Example 1 col. 4 lines 18 – 36 states:

"Crude sludge from a municipal sewage plant and containing 4% solids is homogenized in a crude sludge storage tank. The crude sludge is then quasi-continuously fed into the aerobic conditioning reactor by a flexible tube equipped with an inductive flow meter and a crude sludge feed pump. During this, 60 g of the triammonium salt of nitrilotriacetic acid, dissolved in about 30 l of tap water, are added. Furthermore, 60 g/m.sup.3 of chelating agent-containing crude sludge of a complex enzyme preparation composed of .beta.-glucanase, amylases, proteases and lipases is dissolved in about a 100 fold quantity of tap water and constantly fed in at certain doses. About a tenth of the crude sludge is treated in a ball mill prior to being fed into the aerobic conditioning reactor. There the enzymes contained in the sewage sludge are released leading to reduced needs of added enzymes. A high rate aerator continuously recirculates the sludge in the aerobic conditioning reactor and supplies oxygen." **(Emphasis added)**

And, col. 5 line 41 to col. 6 line 2 states:

"The sewage contains hard to decompose substituents and 3% solids and is pretreated as in Example 1. In case of discontinuous aeration, a centrifugal pump is employed for supplementary recirculation.

The crude sludge temperature is raised by the exothermal metabolic processes of the sludge microorganisms from 20 °C. to about 50 °C within 20 hours. The biological metabolic process and the mechanical action of the high-rate aerator result in a breakdown of organic substance into sludge particles of smaller sizes and thus higher specific surfaces.

The sludge pretreated this way is discharged into an open-topped postreaction tank. The high surface activity of the sludge particles provokes their reaggregation. Shear-stable agglomerates can form because of the fine primary particles created during the reaction phase. By the supply of foreign energy, the pretreated sludge is heated to a constant 50 °C so that the aggregation and degassing will be accelerated.

09/733,392 & 90/005,710
12/21/06

After a reaction time of 15 hours, the sludge is mixed with Zetag 92 ACM/FRG cationic polymeric flocculant and is mechanically dewatered by a decanting centrifuge. The solids separation efficiency is 97-99%. The sludge liquor produced contains less than 0.1% by weight of dry substance and is recirculated for reuse to the head of the sewage plant. The dewatered sludge has a dry matter content of about 32% by weight and hence a high caloric value, a very fine particle size and a low water absorption capacity. It is almost completely odorless." **(Emphasis added)**

Therefore, the '267 teaches a method of chelant and enzyme treatment prior to the addition of a cationic polyacrylamide (Zetag 92).

After reviewing the '267, Applicant/Owner obtained an electronic copy of the '267 from uspto.gov and performed a word search for the terms "thermophile", "thermophilic", "quaternary", "quaternized", "polyquaternary", "di-allyl", and "epi". These words do not even exist in the '267.

The '267 does not teach or suggest the use of a polymeric quaternary ammonium compound to dewater a sludge of any type, much less to dewater a sludge from a thermophilic digestion process. The '267 certainly does not teach or suggest the need of a quaternary polymer, of any type, nor to seek any type of polymer in addition to a cationic polyacrylamide to dewater a sludge from a thermophilic digestion process. This is while the '267 teaches steps not taught or required in the instant invention, e.g. chelating agents and air.

Williams – U.S. Pat. No. 5,561,520 to Williams ('520) teaches an apparatus for measuring the properties of a slurry. Specifically, the abstract states:

"An apparatus for measuring properties of a slurry which comprises a slurry transporting section (16), means for measuring (14a) at a first inspection site the particle size distribution of a slurry entering the transporting section, means for measuring (14b) at a second inspection site the particle size distribution of slurry leaving the transporting section and means for calculating (13a, 13b) from the particle size distribution measured at the first and second inspection sites a parameter related to the floc strength of the slurry which has passed between the first and second inspection sites. The transporting section may comprise a pipe which includes a flow constriction."

The is while the '520 does not teach or suggest to dewater a biological sludge, much less a biological sludge from a thermophilic digestion process. After reviewing the '520, an electronic copy of the '520 was obtained at uspto.gov. The '520 does not even contain the words "sludge", "bio", "thermophilic" "quat"

09/733,392 & 90/005,710
12/21/06

or "quaternized". The one demonstrative example in the '520 is the treatment of a "polydispersed silica" (col. 5 lines 66 – 67). There is no teaching or suggestion in the '520 to dewater a biological sludge, much less to dewater a biological sludge from a thermophilic digestion process.

Eberhard in view of Williams ('267 and '520, respectfully) – There is no teaching or suggestion in the '267 to combine with the '520, as neither the '267 or the '520 teaches or suggests the dewatering of a biological sludge from a thermophilic digestion process. This is while to combine there must be a reason or a suggestion to combine. Therefore, there is no teaching or suggestion in either the '267 or the '520 to develop the instant invention.

McGrow – U.S. Pat. No. 5,213,693 to McGrow and Hoyle ('693) has been cited previously in this proceeding by: the 3rd party requestor in 04/00 and again by the Examiner in a previous Office Action dated 06/02. Applicant/Owner previously traversed the '693 citation on both occasions.

The Examiner quotes from the '693 that in 1990 "It was 'standard practice' to facilitate the dewatering of an aqueous suspension by adding coagulant and/or flocculant to it." This is while Dentel, e.g. Steven K. Dentel, *Evaluation of Dual Chemical Conditioning and Dewatering of Aerobically Digested Biosolids*, August 18, 1996, teaches away from the use of a coagulant and a flocculant in combination to dewater biological sludge. Specifically, Dentel states on page 11-29 that:

"The use of ferric chloride or HDTMA (a quaternary salt) as a preconditioner can reduce the polymer requirement, but this is not a cost effective option at current prices for these additives."

This is while a second article by Dentel, *Evaluation of Dual Chemical Conditioning and Dewatering of Anaerobically Digested Biosolids*, June 1995, and previously cited in this proceeding concludes on page 9 that:

"As a rule of thumb, it appears that adding a proportion of one chemical's optimum dosage reduces the requirement for the other by the same amount. ..If this rule were invariably true, it would always be most economical to use only one of the conditioning chemicals by itself. However, the CST results also indicated that sole use of ferric chloride or HDTMA (quaternary salt) did not provide adequate dewaterability even at the optimum dose..."

09/733,392 & 90/005,710
12/21/06

And, on page 11 that:

"The use of ferric chloride or HDTMA (a quaternary salt) as a preconditioner can reduce the polymer requirement, this is not a cost effective option at current prices for these additives."

Therefore, at late as 1996 it was not economical to "precondition" a biological sludge.

As previously presented to the Examiner by Applicant/Owner, the '693 does not teach either the dewatering of biological sludge from a thermophilic digestion process or the use of a polymeric quaternary ammonium compound to overcome the repulsive forces present in a sludge from a thermophilic digestion process. The '693 teaches the sequential use of a coagulant and a flocculant to eliminate coring and reduce underdosing. Specifically, col. 6 lines 30 – 45 states:

"Compared to the traditional methods using the high molecular weight flocculant alone, the method of the invention gives numerous advantages. The flocs are small, evenly structured and highly filterable and have good shear stability, and the system is relatively resistant to overdosing. Thus the risk of the formation of gelatinous flocs with the consequential disadvantages of coring and reduced productivity can be avoided. In particular, higher cake dry solids can be obtained, again because of the better floc structure. The process is also less susceptible to underdosing, which previously would have led to poor filterability and longer cycle times. Thus, overall, the process can give reduced cycle time, drier cake, better utilization of the capacity of the filter or belt press, improved filtrate quality, better cake release from the cloth, and cleaner filter cloths." **(Emphasis added)**

The above is in strong contrast to the challenges associated with the dewatering of a biological sludge from a thermophilic digestion process, as taught by Applicant/Owner. As demonstrated by Applicant/Owner on belt filter presses and on centrifuges, biological sludge from a thermophilic digestion process does not have a challenge relating to coring or underdosing. Quite the contrary, the sludge from a thermophilic digestion process has demonstrated challenges to form a floc; therefore, coring is not an issue. Further, the sludge from a thermophilic digestion process has demonstrated challenges associated with overdosing, not underdosing. As taught by Applicant/Owner in the Instant invention specification col. 1 lines 30 – 34:

09/733,392 & 90/005,710
12/21/06

"Meanwhile, traditional polyacrylamide polymers used for dewatering have been shown to perform very poorly in tests for dewatering of sludge that has been digested by any thermophilic digestion process." (Emphasis added)

Applicant/Owner also teaches in col. 2 lines 25 – 36:

"Despite the disadvantages of mesophylic bacteria, mesophylic bacteria are preferable in relation to the dewatering of digested sludge. Mesophylic bacteria naturally secrete a polysaccharide which acts as a tackifier providing a chemical mechanism of floc formation. This chemical mechanism is an aid to traditional cationic polyacrylamides to begin the dewatering process. However, thermophilic bacteria do not secrete a tackifying polysaccharide. Furthermore, thermophilic bacteria naturally repel each other. This repelling nature of thermophilic bacteria makes the dewatering of sludge from the thermophilic digestion process expensive and difficult." (Emphasis added)

Applicant/Owner also teaches and demonstrates in col. 4 lines 59 – 65:

"The best performing traditional polyacrylamide technology utilized at the site of this invention was Nalco 9909, manufactured by Nalco Chemical, Inc. Usage of Nalco 9909 results in a dry polymer dosage often near 2,000 ppm and usually near 1,700 ppm treating sludge near 4 percent solids. Even at this dosage, plant throughput was at 20 percent of rated capacity." (Emphasis added)

This horrendous chemical dosage is in very strong contrast to any discussion of underdosing, as taught by McGrow.

Further, claim 6 of the '693 (the claim from which the Examiner quotes):

6. A process in which a suspension of organic solids is flocculated and is then dewatered by filtration on a filter press or belt press, the process comprising

providing a water-soluble particulate mixture of (a) beads of cationic coagulant polymer that has intrinsic viscosity about 0.2 to about 3 dl/g wherein the beads have been made by reverse phase suspension polymerization of 80 to 100% diallyl dimethyl ammonium chloride and 0 to 26% non-ionic monomer and have a size in the range of 70 to 1000 microns and (b) separate beads of cationic flocculant polymer, said flocculant polymer being a copolymer of 8 to 50 mole percent cationic monomer and 50 to 92% non-ionic monomer wherein the cationic monomer is selected from dialkylaminoalkyl (meth) acrylamides and dialkylaminoalkyl (meth) acrylates, as quaternary ammonium or acid addition salts, and said flocculant polymer having intrinsic viscosity above about 5 dl/g, and wherein the beads have been made by reverse phase suspension polymerization and have a size in the range of 70 to 1000 microns, said coagulant polymer being present in an amount of 0.5 to 5 parts per part by weight flocculant polymer,

dissolving into water said particulate mixture and thereby forming a solution of the cationic coagulant polymer and the cationic flocculant polymer,

09/733,392 & 90/005,710
12/21/06

mixing a flocculation effective amount of said solution into the suspension and thereby simultaneously distributing throughout the suspension the dissolved cationic coagulant polymer and the dissolved cationic flocculant polymer,

allowing flocculation to occur,

and dewatering the flocculated suspension by filtration on a filter press or belt press." **(Emphasis added)**

Therefore, the claim from the '693 from which the Examiner quotes has no teaching or claim to dewater biological sludge from a thermophilic digestion process while having many limitations which are not taught or claimed by the instant invention.

In conclusion, the '693 does not teach the dewatering of biological sludge from a thermophilic digestion process or the necessity of a polymeric quaternary ammonium compound to overcome the repulsive forces which are present in a biological sludge from a thermophilic digestion process. This is all while the '693 teaches the use of a "coagulant" with a "flocculant" to minimize "underdosing" which is not a challenge in relation to the dewatering of a biological sludge from a thermophilic digestion process; and in contrast, the dewatering of a biological sludge from a thermophilic digestion process has as a challenge of an extremely high dosage. Further, the '693 teaches the use of a "coagulant" with a "flocculant" to minimize "coring" which is not a challenge in relation to the dewatering of a biological sludge from a thermophilic digestion process; and in contrast, the dewatering of a biological sludge from a thermophilic digestion process has as a challenge of simply forming a floc that will dewater well, which is in strong contrast to coring. This is all while, the '693 has many claim limitations which are not taught or claimed in the instant invention.

Finally, as the '693 does not teach or suggest any of the challenges associated with the dewatering of biological sludge from a thermophilic digestion process or suggest the dewatering of biological sludge from a thermophilic digestion process or suggest the need of a polymeric quaternary ammonium compound, there is no teaching or suggestion within the '693 to combine the '693 with any other technology.

09/733,392 & 90/005,710
12/21/06

Eberhard and McGrow ('267 and '693, respectively) – In order for the '267 and the '693 to combine, there needs to be some motivation within either reference or in the knowledge available to one of ordinary skill in the art to combine. Such is simply lacking. As stated previously, the '267 does not teach or suggest the dewatering of biological sludge from a thermophilic digestion process. Nor does the '267 teach the use of any polymeric quaternary ammonium compound. This is all while the '267 teaches the use of chelants and enzymes. Also, as stated previously, the '693 does not teach or suggest the dewatering of biological sludge from a thermophilic digestion process. Nor does the '693 teach the specific need of a polymeric quaternary ammonium compound to dewater biological sludge from a thermophilic digestion process. Therefore, there is no evidence of a teaching or a suggestion or a motivation to combine the '267 with the '693. This is while such a combination would render a teaching that includes chelants, enzymes, and dry polymer compositions which are not taught or claimed in the instant claims.

McGrow in view of Reimschuessel and Payne ('693 and '396 and '774, respectively) – This combination simply does not teach or suggest the instant invention or the claims of the instant invention. As stated previously, the '693 does not teach the dewatering of biological sludge from a thermophilic digestion process or the necessity of a polymeric quaternary ammonium compound to overcome the repulsive forces which are present in a biological sludge from a thermophilic digestion process. This is all while the '693 teaches the use of a "coagulant" with a "floculant" to minimize "underdosing" and "coring", neither of which is not a challenge in relation to the dewatering of a biological sludge from a thermophilic digestion process. This is while the dewatering of a biological sludge from a thermophilic digestion process has as challenges: inability to simply forming a floc that will dewater well (which is in strong contrast to coring) and overdosing (which is in strong contrast to underdosing). This is all while, the '693 has many claim limitations which are not taught or claimed in the instant invention.

As the '693 is silent on biological sludge from a thermophilic digestion process, there is no teaching, suggestion or motivation within the '693 to combine with any

09/733,392 & 90/005,710
12/21/06

other teaching to obtain the instant invention. Had the '693 recognized that biological sludge from a thermophilic digestion process were difficult to dewater, then there would be a motivation; however, there is no such teaching or suggestion in the '693.

This is all while the '774 is totally lacking in any teaching as to a polymeric quaternary ammonium compound or the dewatering of biological solids from a thermophilic digestion process. Therefore, there is no reason or suggestion within the '774 to use the Percol DADMAC stated therein in the dewatering of biological sludge from a thermophilic digestion process. Had the '774 recognized that biological sludge from a thermophilic digestion process was difficult to dewater or that the DADMAC or the Percol were an asset to floc formation with thermophiles, then there would be a motivation; however, there is no such teaching or suggestion in the '774. Therefore, there is no teaching or suggestion in the '774 to combine with the '693.

The above is all while the '396 has no teaching as to the dewatering of any biological sludge from a thermophilic digestion process. The '396 does describe ways to manufacture a polyacrylamide comprising a quaternized moiety; however, the '396 does not teach or suggest the importance of a quaternized moiety, e.g. polymeric quaternary ammonium compound, in the dewatering of biological sludge from a thermophilic digestion process.

Eberhard (in view of Williams) and McGrow (in view of Reimschuessel and Payne) - ('267 (in view of '520) and '693 in (view of '396 and '774) - While a rather involved combination, this combination still does not teach the dewatering of biological sludge from a thermophilic digestion process. Also, this combination, in order to be combined properly, must have a motivation to combine. As stated previously, none of these references provide any reason or motivation to combine the '267 with the '693. This is while, again, should such a combination be made, the teaching of such a combination lacks the teaching of the importance of a polymeric quaternary ammonium compound, as taught and claimed in the instant invention. Further, the '267 teaches and claims the use of a chelant and an enzyme, neither of which is taught or suggested in the instant invention. Further

09/733,392 & 90/005,710
12/21/06

still, the '693 teaches and claims compositions of dry polymers which are not taught or claimed in the Instant Invention.

If all of the above technical and legal arguments are not enough, then there is the teaching of the US EPA, as previously presented in this proceeding. Specifically, the US EPA document TBS Prakasam, et al. *Effect of Recycling Thermophilic Sludge on the Activated Sludge Process*, EPA Project Summary 5, Sept. 1990 states under the heading of Dewaterability:

"Capillary suction time (CST) measurements at various polymer dosages indicated that mesophilic sludge required a lower polymer dosage than did the thermophilic sludge (10 vs. 22.5 kg/dry tonne) to achieve the minimum CST that was possible. The thermophilic sludge, however, exhibited highest floc strength than did the mesophilic sludge.

Pilot scale centrifuge studies confirmed that the thermophilic sludge required a higher polymer dosage than did the mesophilic sludge. At optimal polymer dosages, those studies also indicated that the mesophilic sludge approached 100% solids capture whereas the thermophilic solids approached a maximum of 96% solids capture. The lower solids capture with thermophilic sludge probably resulted from the higher concentration of fine particles in it than in the mesophilic sludge."

The report goes on to recommend that:

"Based on the lack of effect on sludge mass and the increase in digestion capability required, the Torpsy process is not recommended for Chicago's conventional rate activated sludge plants. Nor is thermophilic digestion as the terminal sludge digestion process recommended if the sludge is to be used at a site with nearby neighbors."

Therefore, at a time wherein all of the Examiner's citations were available, the US EPA, a pre-eminent authority was not able to practice the instant invention from the available teachings, e.g. the Examiner's citations.

In conclusion, there is no teaching, suggestion or motivation to combine the '267 with the '693 in order to obtain the instant invention. As Applicant/Owner has respectfully traversed the Examiner's rejection, Applicant respectfully requests an allowance of claims 1 - 2, 4 - 8, 10 - 13, 15 - 16, 19, 22, 24 - 28, 33 - 38, 40, 41, 44 - 48, 51 - 55, 67 - 71 and 73 as amended herein.

Dependant Claims - In addition to the above arguments, Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent

09/733,392 & 90/005,710
12/21/06

claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988."

Applicant/Owner herein respectfully requests an allowance of claim 2, 4, 5, 6, 7, 8, 10, 11, 12, 15 and 16 as amended herein, as: the Examiner's argument has been traversed relating to independent claim 1 from which dependant claims 2, 4, 5, 6, 7, 8, 10, 11, 12, 15 and 16 have priority. Applicant/Owner herein respectfully requests an allowance of claim 27 and 28 as amended herein, as the Examiner's argument has been traversed relating to Independent claim 22 from which dependant claims 27 and 28 have priority.

35 U.S.C. 103(a) Eberhard, McGrow and Sak ('693, '267 and '139, respectively) – Applicant/Owner herein repeats the above '693 and '267 presentations, as well as the above argument against a combination of the '693 and the '267. Since there is no teaching or suggestion within the '693 or the '267 to obtain the instant invention while there is no teaching, suggestion or motivation within either the '693 or the '267 to combine with the other to obtain the instant invention, any teaching by the '139 to combine primary and secondary sludge in dewatering cannot defeat the inherent novelty in claim 14, as claim 14 depends on claim 1.

Alternatively, as Applicant/Owner has traversed the Examiner's rejection of claim 1, MPEP Section 2143.03 states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." Applicant/Owner herein respectfully requests an allowance of claim 14 as amended herein.

35 U.S.C. 103(a) Eberhard, McGrow & Sivakumar ('267, '693 and '719, respectively) - Applicant/Owner herein repeats the same arguments from above relating to the combination of Eberhard and McGrow. Therefore, as claim 3 depends on claim 1 and Applicant has traversed the Examiner's rejection of claim 1, claim 3 is novel over the art cited.

Alternatively, as Applicant/Owner has traversed the Examiner's rejection of claim 1, MPEP Section 2143.03 states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837

09/733,392 & 90/005,710
12/21/06

F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." Applicant/Owner herein respectfully requests an allowance of claim 3 as amended herein.

Carlsson in view of McGrow ('638 and '693) – The '638 teaches methods for thermophilic reaction. This is while the dewatering methods taught in the '693 require the use of enzymes and air flotation. Specifically col. 1 line 62 to col. 2 line 2 states:

"In order to achieve the necessary level of reaction and rapidity in the process according to the present invention, certain critical conditions as regards the particle size, dry matter content and pH must be satisfied. Moreover, the process may be accelerated further by an addition of certain enzymes or by the recirculation of active thermophilic substances which assist in the degradation process and/or the dewatering of the treated matter."

Further, col. 7 lines 52 – 68 states:

"When the degradation treatment is completed, the slurry is removed from the degradation reactor and subjected to dewatering. The dewatering is carried out in a suitable manner, such as by filtering, sedimentation, deposition/flocculation and the like, but a method of dewatering which is particularly preferred according to the present invention is the so-called "microflotation" process, in which extremely small micro-gas bubbles are created in the slurry in that pressurized liquid containing dissolved gas is introduced into the slurry. When the pressurized liquid is introduced into the slurry, the pressure in the pressurized liquid falls and the dissolved gas is released in the form of an amount of very small bubbles which rise upwardly and entrain the particles in the slurry. For closer details concerning such microflotation, the reader is referred to, for example, Swedish patent application No. 7414758-8." **(Emphasis added)**

Applicant/Owner can find no teaching or suggestion in the '638 to dewater a biological sludge from a thermophilic digestion process with a polymeric quaternary ammonium compound or a polymeric quaternary ammonium compound in combination with a polyacrylamide. To ascertain if there was any teaching or suggestion as to the teachings of the instant invention in the cited '638, Applicant/Owner performed a word search in the '638 for "quat", "quaternary", "polyquaternary", "polyacrylamide", and "polysaccharide". These words do not even appear in the '638.

There must be a teaching, suggestion or motivation to combine the '638 with the '693. As both the '638 and the '693 are silent on the challenges to dewater biological sludge from a thermophilic digestion process, while also being silent on the need for a polymeric quaternary ammonium compound, there is no teaching,

09/733,392 & 90/005,710
12/21/06

suggestion or motivation to combine the '638 and the '693 to obtain the instant invention. This is while if such a combination were made, the resultant teaching would include the use of enzymes, air bubbles, a coagulant (which may or may not have a quaternized moiety) and a flocculant (which may or may not have a quaternized moiety; therefore, if the '638 and the '693 are combined, one still cannot obtain the instant invention.

As Applicant/Owner has respectfully traversed the Examiner's rejection, Applicant herein respectfully requests an allowance of claims 1 and 2.

Secondary Considerations

As further evidence of non-obviousness of the instant invention, Applicant/Inventor herein presents to the Examiner a declaration by Audrey Haase and of Richard Haase, wherein it is noted that only after disclosure and/or teaching by Applicant/Owner in the marketplace was the invention obvious to 3rd parties.

It is of high importance to note that while many of the citations presented by the Examiner are owned by the 3rd party requestor of this proceeding, it was only after the teaching of the instant invention by Applicant/Owner to the 3rd party requestor, when the 3rd party requestor was acting as a supplier to the Applicant/Owner, was the 3rd party requestor able to obtain the instant invention in College Station and in Texarkana, Texas, ref. declaration of Audrey Haase.

It is of importance to note that the Hyperion Waste Water Treatment Plant, Los Angeles, California is today utilizing a polymeric quaternary ammonium compound to dewater biological sludge from a thermophilic digestion process, ref. declaration and exhibits of Richard Haase.

Case Law Supportive of Applicant/Owner

As none of the combinations cited by the Examiner teach the "source of the problem" in the dewatering of a biological sludge from a thermophilic digestion process, nor do any of the citations "contain the same solution for a similar problem", Applicant/Owner would like to cite MPEP 2141.02, which states:

09/733,392 & 90/005,710
12/21/06

"[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the 'subject matter as a whole' which should always be considered in determining the obviousness of an invention under 35 U.S.C. § 103." *In re Spinnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). However, "discovery of the cause of a problem ... does not always result in a patentable invention. . . . [A] different situation exists where the solution is obvious from prior art which contains the same solution for a similar problem." *In re Wiseman*, 596 F.2d 1019, 1022, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original)." **(Emphasis added)**

Further, as none of the references cited, alone or in combination, teach or suggest all of the claim limitations of the instant invention claims, Applicant/Owner would like to cite MPEP 2143.02, which states:

"To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending there from is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)." **(Emphasis added)**

In direct support of the facts of copying by others, as evidenced in the declarations submitted, Applicant/Owner would like to cite MPEP 716.06, which states:

"Evidence of copying was persuasive of nonobviousness when an alleged infringer tried for a substantial length of time to design a product or process similar to the claimed invention, but failed and then copied the claimed invention instead. *Dow Chem. Co. v. American Cyanamid Co.*, 837 F.2d 469, 2 USPQ2d 1350 (Fed. Cir. 1987)." **(Emphasis added)**

Applicant/Owner is also providing for the Examiner a copy of *In re Doyle*, 293 F.3d 1355, 63 USPQ2d 1161 (Fed. Cir. 2002) where the court permitted the patentee to file a reissue application to present a so-called linking claim, a claim broad enough to read on or link the invention elected (and patented) together with the invention not elected. This case law directly supports the breadth of claim 33, while the teaching of claim 33, e.g. polymeric quaternary ammonium compound, is outside of the restriction requirement placed on the parent application and relating to Methods Three and Four.

09/733,392 & 90/005,710

12/08/06

Amendment

Conclusion

Applicant/Owner respectfully requests allowance of all amended claims herein. The amendments to the claims do not raise any new matter issues and no additional searching is required. Additionally, Applicant/Owner requests that in view of this fact, the amendment be entered, and after due consideration of the facts presented herein, the claims be allowed and a certificate be issued.

While Applicant/Owner has presented technical and legal argument to traverse the Examiner's rejections, Applicant owner has also provided secondary considerations in support of the instant claims.

To facilitate the resolution of any issues or questions presented by this paper, Applicant/Owner respectfully requests that the Examiner directly contact the undersigned by phone to further the discussion, reconsideration and allowance of the claims.

Respectfully submitted,

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